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ence from summer to winter, and throughout the winter it is more distinct than the differences of day and night. March is a good example, with its four warm spells and four cold spells. From 3°, March 6th, the temperature rose 67° on the 13th, to drop again to 15° on the 15th of the month. Such a warm spell was the "January thaw" of the middle of that month. As usual there were several of them. On the right of the diagram, October has "Indian summer" in its initial warm spell, following the cold spells of late September. Other cold spells appear as the "early frosts" of November and the "late frosts" of May.

It is impossible to run the eye along the graph for Ancón without being impressed by the fact that the warmth of the tropics is amazingly steady.

NORTHERN PATAGONIA[1]

A RESUMÉ OF MR. BAILEY WILLIS'S SURVEYS ALONG THE FORTY-FIRST PARALLEL

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INTRODUCTION

The versatile and brilliant quality of Mr. Willis's work has nowhere else been shown to such good advantage as in the series of books and reports on Patagonia that have come from his pen during the past two years. A condensed account of his first season's work was published in the *Geographical Journal* (London), Vol. 40, 1912, pp. 607-615: "Recent Surveys in Northern Patagonia."[2] The latest contribution is a striking book entitled "Northern Patagonia," published in an English and a separate Spanish edition by authority of the Ministry of Public Works of the Argentine Republic and accompanied by a set of thirteen maps showing geologic, topographic and forestry conditions and a tentative land classification of the Andes of Northern Patagonia. For the present this volume closes the series of reports, as the

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[1] Northern Patagonia. Character and Resources. Vol. 1: A study of the elements of development in the region tributary to the national railway from Port San Antonio to Lago Nahuel Huapí and the extension to Valdivia, Chile, including the Andean lake district. Text and maps by the Comisión de Estudios Hidrológicos. Bailey Willis, Director, 1911-14. 464 pp. Maps, ills., index and maps in separate case. Ministry of Public Works, Argentine Republic. Charles Scribner's Sons, New York, 1914. $6, postage extra. Maps in separate case, $2. 10 x 7.

[2] An abstract of this paper (with a map) was published in the *Bulletin* (Vol. 45, 1913, pp. 357-359. Since then he has published a closely organized and illuminating account of the geographic problems of Argentina under the title, "The Physical Basis of the Argentine Nation" (Latin America; Clark University Addresses, November, 1913; edited by G. H. Blakeslee, 1914; pp. 342-359). In addition there have been published "The Forty-First Parallel Survey of Argentina" and "Physiography of the Cordillera de los Andes between Latitudes 39° and 44° South" in the *Compte Rendu* of the Twelfth International Geological Congress of 1913 (published in 1914). pp. 713-731 and 733-756, respectively.

Argentine Government is not in position to continue the publications. Manuscript reports and maps, representing a considerable cost and of high value to the future of the country, remain to be published.

It is difficult to exaggerate the importance of these clear-cut, authoritative interpretations of the geography and geology of the forty-first parallel south. The region was not by any means unexplored; it has been visited by at least a round dozen of explorers in the last hundred years, and parts of it have been studied in moderate detail. Mr. Willis's work is distinctive in that he has a basis of accurate topographic surveys, an extraordinarily wide range of previous experience, and that critical spirit so necessary for the testing of rival theories of origin. Moreover, his results in land classification are essentially geographic throughout. A comparable piece of work does not exist for any other part of South America. The climax of interest is reached in the fact that no part of Argentina has a more favorable climate for peoples accustomed to the temperate zone than the region about Lake Nahuel Huapí. The favorable conjunction of these many lines of interesting investigation lends to his work the highest distinction.

In the following paragraphs we shall outline only the principal points of geographic interest.

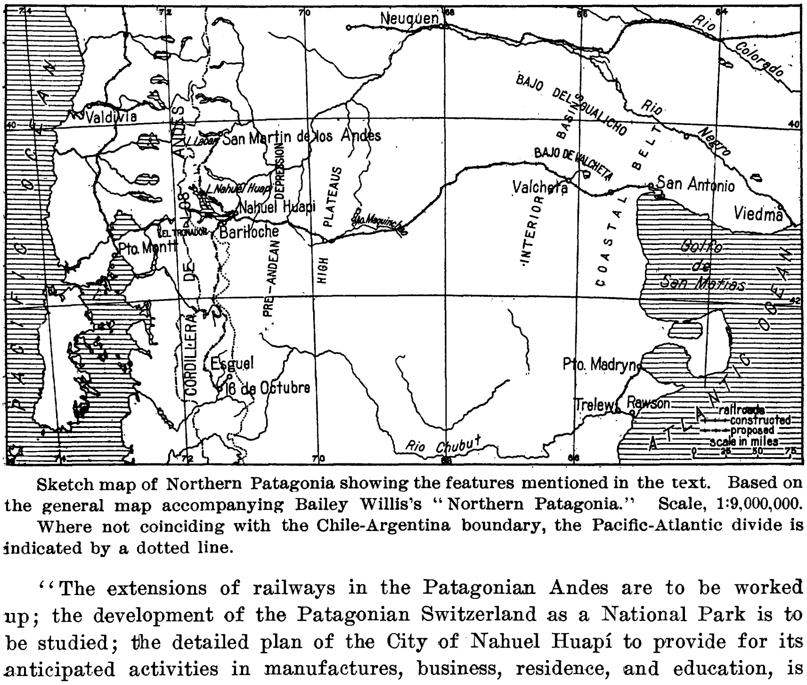
ORGANIZATION AND SCOPE OF SURVEYS

The forty-first parallel survey of South America was organized in January, 1914, under the Minister of Public Works of the Argentine Republic. It was designed primarily for the study of water supplies with the hope that the semi-arid region in which railroad construction was in progress might yield water in sufficient quantity to serve the purposes of the railway and of settlement. It was found that the geologic structure was unfavorable to the accumulation of artesian waters, and therefore the attention of the commission was directed to the problem of water storage and of canals to conduct the water to desirable localities. In the subsequent development of the surveys the Cordillera of the Andes was explored for routes of communication, for centers of settlement, for its resources of water supplies and forests, and the land was classified according to its future use. It will be seen, therefore, that the survey consisted of the investigation of a group of problems in economic geography. Field work was prosecuted vigorously until April, 1913, the operations being carried on in different districts according to the season. The topographic surveys were executed by Emilio E. Frey, C. L. Nelson, W. B. Lewis, C. F. Eberly, and J. S. Mercer; the geologists were Bailey Willis, J. R. Pemberton, and C. W. Washburne; the economic geography was studied by Messrs. Willis, Pemberton, and W. D. Jones; railroad surveys were made by D. L. Reaburn and J. G. Morgan. Arrangements were made with the government for enlarging the scope of the work with the beginning of 1914. But in 1914 the plans were interfered with by changes in the administration and by the difficult economic situation of the country as a whole. Finally the Commision de Estudios Hidrológicos ,was disbanded June 30, 1914, except that a single engineer continued topographic surveying up to the end of the year.

During the first four months of 1914 field work was carried on about Lago Nahuel Huapí by Señor Frey, by Messrs. W. B. Lewis and O. G. Taylor, topographers of the U. S. Geological Survey, and J. S. Mercer. The last named made an excellent map (not yet engraved) of El Tronador, the snow peak that dominates the region, and determined the altitude to be 3,555 meters (11,663 feet), rather than 3,460 meters as heretofore given.

"Our principal work was directed to intensifying the studies of the future cities Bariloche, the tourist center, and Nahuel Huapí, the industrial railway terminus of the national trans-continental line across Patagonia. Large-scale, detailed maps were made of the sites, and also of dam sites, etc., to serve as a basis for city planning and development of water supply and power."

The results of these studies seemed likely to be buried in the Argentine archives for the President was wisely insisting on the severest economy. Through the active interest of a group of public officials, all men of sound practical statesmanship, an arrangement was consummated by which Mr. Willis was authorized to prepare manuscript reports in the United States, and these reports are to be the sequel to "Northern Patagonia."



Sketch map of Northern Patagonia showing the features mentioned in the text. Based on the general map accompanying Bailey Willis's "Northern Patagonia." Scale, 1:9,000,000. Where not coinciding with the Chile-Argentina boundary, the Pacific-Atlantic divide is indicated by a dotted line.

"The extensions of railways in the Patagonian Andes are to be worked up; the development of the Patagonian Switzerland as a National Park is to be studied; the detailed plan of the City of Nahuel Huapí to provide for its anticipated activities in manufactures, business, residence, and education, is to be designed, and the program is to include the writing up of the general geology, so far as our observations permit." (Letter from Willis.)

PHYSIOGRAPHY

The Eastern Pampas. Northern Patagonia falls broadly into two distinct physiographic provinces—the treeless pampas of the east and the heavily forested Cordillera of the Andes on the west. The former is semi-arid; the latter has an abundant rainfall and resources of climate and soil sufficient to support a dense population.

The pampa region falls into four districts. Named in order westward from the Atlantic coast they are as follows: the *coastal belt,* the district of *interior basins,* the *high plateaus,* and the *pre-Andean depression.* The *coastal belt* near San Antonio is low and bordered seaward by cliffs, from the top of which there extends westward a rising plain with moderate gradients. This plain has been warped so that the immediate San Antonio district is a depressed area with reference to the surrounding lands with steeper gradients. It is one of a family of depressions in Northern Patagonia, some of them of great extent and without outlets and designated by the descriptive Spanish name of *bajos.* Beside the major basins there are innumerable small basins which form transient ponds during the rainy season and which are due to wind erosion. The plain is made up of porous gravels which, in the semi-arid climate of the region, support desert shrubs and certain grasses that afford excellent pasture.

West of the *coastal belt* is a great *depression* called the ''Bajo de Valcheta.'' It is bordered on the southwest by a *plateau* capped by heavy lava flows, and from this plateau several streams run northeast into the depression, where they are lost in gravel beds or form salt lakes and evaporate.

North of the forty-first parallel the district of the interior basins sinks to much lower elevations and in the Bajo del Gualicho, or Devil's Deep, a depression of great length south of the Rio Negro, it drops to thirty meters (98½ feet) below sea level. The surface is covered by wind-blown material or by alluvial deposits, marked by salt plains, sand dunes and gravelly stretches. It has a distinctly desert aspect. Surface water is scarce and that found in wells is commonly salt.

At the season of rains or melting snows the exceedingly irregular surface of the lava plateau is covered with ponds whose waters sink into the crevices in the deep lava mass. The fissures become narrower below, so that, though the water is received quickly, it is delivered slowly. Thus the run-off on the plateaus is small and evaporation is small and delivery correspondingly large. The inverse holds true with the plains, where the amount of evaporation is large and the run-off is large. The lava field is therefore a great reservoir for water upon which the population of the border region must depend, though the lava country is itself too stony and too high for cultivation.

The size of the streams and the continuity of their flow depend upon the capacity of the plateaus from which they derive their supplies and also upon the capacity to deliver it, in concentrated form, in a large stream with more or less steadiness throughout the year. Where there are no lava plateaus there are no considerable streams.

West of the Bajo de Valcheta and about 200 kilometers (124 miles) west of San Antonio is a hilly region, where the only possibilities for human life grow out of the springs that issue from the bases of the lava remnants and that support irrigation to a limited degree.

Still farther west, and 380 kilometers (186½ miles) from San Antonio, the elevation is 900 meters (2,953 feet) above the sea. We are here in the Maquinchao valley, which is the site of an English estancia (ranch) 600,000 acres in extent, which will eventually be settled by a community dependent upon the waters of the stream to irrigate the rich valley lands. It is a semi-arid region, with a distinctly variable rainfall. Other gorges and depressions, with limited possibilities for pastures not too high for winter grazing, continue the high plateaus westward to the next physiographic province.

The district of the *high plateaus* is from 1,000 to 1,200 meters (3,280 to 3,940 feet), and in places 1,600 meters (5,250 feet) above the sea. It is a broad elevated plain, cut by deep valleys and surmounted by mountain peaks distributed singly or in groups, and easily traversed in various directions by many passes. The valleys, though generally wide, narrow in many places to mere gateways or to impassable gorges. Parts of it are very picturesque and varied in profile and color.

The *pre-Andean depression* extends along the eastern front of the Andean Cordillera and is due to continental warping. It is not a continuous trough, since it has been filled in by volcanic material from local centers of eruption and by glacial formations derived from the west, and both classes of material have been more or less eroded according to their age. The trough is bordered on the east by the high plateaus which extend parallel to and at almost the same elevation as the Cordillera itself. It is occupied by various rivers whose courses were determined by orogenic depression. The rivers have sunk their channels in the original structural valley floors and in places flow in canyons bounded by rocky walls.

The Cordillera de los Andes between Latitudes 39° and 44° South. The Patagonian Cordillera between 39° and 44° south is not a mountain ridge, but a broad mountain zone wherein the summits rise in general to a common, nearly uniform, altitude above the sea. It has numerous lakes, many of them of notable size and beauty. It is traversed by faults which run longitudinally and have given rise to certain longitudinal valleys which lie between the Eastern and Western Cordilleras. There is no evidence of transverse faults. In the analysis of the topography it is necessary to distinguish between the effects of faulting, or erosion by streams, of stream capture, of erosion and damming by glaciers, etc.

Mr. Willis recognizes the following physiographic epochs: (1) epoch of mature erosion and low relief expressed in the highest summits and valleys; (2) epoch of elevation and deep canyon-cutting; (3) epoch of early glaciation; (4) inter-Glacial epoch; (5) epoch of latest glaciation; (6) post-Glacial or present epoch.

From 1,200 to 1,690 meters (3,940 to 5,250 feet) above the sea in the mountain zone one may recognize a well-marked topographic unconformity. Below this level are the immature canyon walls; above are the mature valleys and divides. The mature valleys run, finally, to sharp ridges, acute peaks, and to somewhat extensive plateaus of structural rather than of erosional origin. Residual deposits still remain on the eastern mountains in places, but in general have been replaced by glacial deposits. For reasons too complex to discuss here the age of this mature surface is assigned to the Pliocene. The local relief of the mature surface amounts to 500 meters (1,640 feet) between hilltops on the one hand and nearby valleys on the other. The surface is, therefore, not a plain, in spite of the uniformity of summit altitudes. In favorable situations the eye may discern many spurs so related to each other in form and slope as to represent a former extensive surface now rendered discontinuous because of the development of recent canyons and ravines.

If this surface be traced eastward, it may be seen passing into the surface of gravel deposits which cap the eastern mesas. In places the gravels lie upon summits formed of horizontally bedded lavas, but in many other cases they lie upon metamorphic rocks and granite carved into an ancient surface of erosion. Many of the striking topographic features are of more recent origin than the gentle profiles that, from a physiographic standpoint, dominate the landscape.

Thus Mount Tronador is a volcanic peak which rests upon a granite basement 1,600 to 2,000 meters (5,250 to 6,562 feet) above the sea. The flows of the volcano filled ancient valleys and were disposed upon an ancient surface. The partial destruction of the ancient surface has, therefore, taken place by stream erosion and its partial burial by accumulations of volcanic lava.

In the upraising of the Andean belt to the altitude which it now has, the process of elevation was gradual and was accompanied by elaborate changes in the drainage system. The width of the Andes at latitude 41° 30′ is about 100 kilometers (62 statute miles). A fault marked by a central valley divides the Cordillera into an eastern and a western portion. On each of the two flanks of this flat-topped mountain belt the surface was flexed into a monocline by which the plateau-like summit was connected with the lower surfaces on either side. The descent on the western slope is 2,000 meters (6,562 feet); that on the eastern into the pre-Andean depression is 600 to 800 meters (1,968 to 2,625 feet).

In the process of elevation the normal fault which now bounds the central valley along its eastern side developed across the courses of certain Atlantic rivers at right angles to them and broke the streams in two. Their headwaters were thus diverted into the central valley and being captured by Pacific streams became tributaries of that ocean. The effect was to fix the passes on the Eastern and Western Cordillera nearly as they now exist, leaving sections of the old valleys in the wide flats that saddle the mountain ridges on either side of the central depression. The pronounced elevation of the Western Cordillera above the downthrown fault block of the central valley has accelerated the streams of the eastern slopes of the Western Cordillera so that the Atlantic drainage probably encroached upon the Pacific in the early stage of drainage readjustment. But the advantage of nearness to the Pacific and considerable elevation above it gave the short Pacific streams the opportunity of finally encroaching upon the Atlantic drainage.

After the range had attained an altitude very nearly that which it now has, a climatic change resulted in the development of extensive glaciers. The most notable effect of this early glaciation was the excavation of lake basins which transformed sections of many of the canyons into very deep lakes—the most conspicuous feature of the map of the southern Andes. The glaciers originated in headwater amphitheaters from 1,500 to 2,000 meters (4,920 to 6,560 feet) above the sea and were conducted by the channels of the minor canyons into the main canyon of each system. The effect was to concentrate an enormous volume of ice, which was carried forward under a head of about 500 to 1,000 meters (1,640 to 3,280 feet). This corraded the rock deeply and upon the retreat of the glaciers left rock-bound basins. One of the effects of the earliest glaciation was to throw loop-moraines across the valleys occupied by ice, thus causing some disturbance of the drainage.

The earlier glacial epoch was succeeded by a long interval of milder climate, during which the glaciers retreated to the highest summits of the Andes or entirely disappeared. In the interval since then the moraines of the earlier period have been remodelled superficially, so that they no longer display the typical features of glacial topography and their materials have decayed to a notable degree. The interglacial interval was succeeded by a fresh advance of the ice, so that many of the lakes are dammed by glacial moraines of the later epoch. In some cases the later moraines became a part of the continental divide, turning the lake waters back of them into the Pacific drainage. In other cases the lake waters rose to a notch on the border of a moraine and occupied a channel deep-cut in rock. The latest glaciation of all was by no means so extensive as the earlier and has produced no pronounced changes.

HUMAN GEOGRAPHY

Turning to the human geography in Mr. Willis's publications, we find an unusually rich collection of data on the climatology, the resources, the distribution of people, and the possibilities of future development. The introductory chapter which deals with the general geography of Patagonia we dare say will long be a standard work on that country. Moreover, a very clear picture is drawn of the relations of the still remote region of Patagonia and the more densely populated provinces along the Paraná. It is especially satisfactory to note the section on the conservation of soils and water supply in the Argentine domain.

> ''Exploitation and conservation are by many considered to be contradictory terms, exploitation being taken to mean exhaustive utilization for immediate profit, and conservation representing the idea of preservation for future use. But this view has often been shown to be incorrect. Exploitation of natural resources with due regard for prevention of waste and reproduction of crops is conservation. Conservation means that that which is ripe shall be used, whereas that which is not ripe shall be neither used nor destroyed but shall await the time of maturity. This applies to all things that grow, to grass and to trees. The things that do not grow, such as soil and waters, are conserved in preventing their waste and promoting their highest utilization.''

In the application of this principle special attention is paid to the forests of Argentina, their protection against fire, the necessity of police patrol to prevent injury from the wandering cattle herder, and the commercial development of their useful timber so as not to destroy the water supply for the bordering population groups.

There is no other resource of equal importance with water in Argentina. It is distinctly a problem in conservation to make topographic and hydrographic studies so that definite information of the nature and conditions of the supply of water may be secured. Likewise grazing demands a better knowledge of the grazing plants now available, their nutritive value, relative abundance, and other characteristics bearing on their use as fodder plants.

Some notes on the climate of Patagonia are of interest in view of the general ignorance in this country of the excellent reports by Walter G. Davis of the Argentine Meteorological Office. We are, of course, familiar with the contrast between the eastern and western sides of the Andes, but we are not all familiar with the degree of contrast. In the narrow Andean zone the annual precipitation diminishes from 3,000 millimeters or more in the mountains to 1,000 or 800 millimeters at the eastern margin, and to 600-200 millimeters over the plateaus of Patagonia. Both rain and snow have a distribution opposed to that of temperature for the greater precipitation is in the colder districts, and the lesser in the warmer northeastern districts; that is, the central and northern parts of Patagonia, midway between the Atlantic and the Cordillera, have the highest summer temperature and the least rainfall. Southward along the Atlantic margin the rains increase gradually and the temperature is lower. In passing from east to west there is a change from light and infrequent snowfall on the coast to heavy, and, in the alpine zone, permanent snowfall in the Andes. In latitude 41°, from 2,000 to 2,500 meters (6,562 to 8,200 feet) high, the mountains support permanent snow fields and the farther south one goes the more extensive become the glaciers.

The transition between the heavy snowfall of the Cordillera and the light snowfall of the Pampa region is so sudden that stock may be driven down from the region of snow to the region of light snow or no snow at all in a very short space of time and, for the most part, snows do not create a serious obstacle to the wintering of livestock in the pampas even in the far south.

The treeless plains and plateaus of Patagonia offer no obstruction to the air currents that cascade down from the Andean heights. Evaporation is high and there is, therefore, a high degree of physiological dryness. Animals and even men likewise suffer from the wind.

Special interest attaches to the detailed description of the economic resources along the line of the new railroad that stretches westward from San Antonio. The bay of San Antonio, on the Atlantic coast, is an excellent port. At the other end of the line nearing completion, is Lago Nahuel Huapí, a lake of great scenic and historic interest, and one that lies in the center of a potentially rich though still unsettled agricultural region. The trunk line of the railroad is 630 kilometers (391½ miles) long. Its position was determined by topographic conditions; had it been located farther north it would have been too near the valley of the Rio Negro and would have been obliged to cross the very arid Bajo del Gualicho; located farther south it would have had to pass a group of high plateaus. Moreover, the line selected passes through a zone of more available water supply. The first hundred kilometers (62 miles) cross a high coastal plain where permanent settlements must always be few on account of deficient water supply. The next 110 kilometers (68 miles) pass through a section where a group of gorges and valleys are drained by streams along whose floors agriculture may be developed and a resident population established. The third section, 170 kilometers (95½ miles) in length, has grazing possibilities, but the settlements will be restricted to scattered ranch houses. Farther west the road enters the district of the interior valleys capable of development as irrigation districts and of supporting agricultural population, but having extensive tributary grazing areas. Westward from a point 480 kilometers (298 miles) west of San Antonio the route runs across the high plateau country, interrupted by narrow tortuous valleys, among hills and plateaus favorably conditioned for grazing. Agriculture can be developed only as an auxiliary industry and in small areas of valley lands. Beyond the plateaus is a region of lesser relief and with increased opportunities for irrigation and settlement.

Summarizing, we may say that the resources along the line of the railroad are chiefly pastoral. The freight will consist of wool, meat, hides, bones and alfalfa or other hay suitable for sheep and cattle.

At its western end the trunk line touches a very different country, the lake and valley region of the Andes. Here the conditions are favorable for the establishment of a numerous and vigorous population and here is the chief justification for so extensive a railroad.

The city of Nahuel Haupí is destined to become a manufacturing center for supplying the needs of the agricultural people of the northern provinces. The raw materials will be transported over the trunk line to San Antonio for shipment by water to the largest centers of distribution: Buenos Aires, Rosario, etc. Moreover, on the Andean border and south of Lake Nahuel Huapí are agricultural valleys and centers of population suitable for cattle raising and dairying, and all of the products will find an outlet over the same line provided that branches are extended north and south of the lake.

Two branches within the Cordillera are proposed. One runs south to Esguel, the principal town in the colony of the 16th of October. It will be 312 kilometers (194 miles) long and will pass through the center of the longitudinal valley of the Andes. In addition to the natural resources are the beautiful lakes and snow peaks and the attractive scenery that should develop an extensive tourist travel. At present the valleys are occupied by Chilean squatters and the mountain slopes are ranged by their herds of cattle. It is a region that can be made tributary to Lago Nahuel Huapí and the east, though at the present time the more practicable routes of travel lead westward into Chile.

A northern branch of the San Antonio railroad would lead to San Martin de los Andes at the head of Lago Lacar, 650 meters (2,132 feet) above the sea.

Many attempts have been made to find potable water in various parts of Patagonia and deep wells have been drilled at San Antonio Oeste and La Travesía, 62 kilometers (38½ miles) west of San Antonio. Both wells penetrated sand and gravel and at 105 and 67 meters (344 and 220 feet) respectively, entered the complex of granite and metamorphic rocks which forms the mass of the old continent. Small flows of more or less brackish water were encountered and additional wells were not thought practicable. At Puerto Madryn a well has been drilled 700 meters (2,297 feet) deep in sedimentary strata, to the underlying granite, but without satisfactory results. Throughout the coastal plain various water-bearing layers have been encountered at depths of fifty to a hundred meters. In some places both fresh and salt water may be encountered at different depths in one and the same well.

The determination of the conditions of water supply in the basins of northern Patagonia is rendered very difficult by the high percentage of salt which the underground waters carry. Fresh ground water may rarely be found except on slopes or on the higher plains and plateaus.

The grazing industry has been established in Patagonia for about twenty-five years and has spread until now nearly all the ranges are occupied and the more accessible or desirable ranges are overstocked. The undirected occupation of the ranges is typically nomadic. The flocks graze all summer in the valleys where they must feed all winter. This is done on the ground that the nomadic herdsman occupying public land has no right to the range he occupies, hence if he leaves it, he loses it. The result is an uneconomic use of the pasture. Moreover, many squatters are men of little means—Indians, half-breeds, or poor frontiersmen, whose livelihood is in their flocks. Others are wealthy sheep owners who secure large returns on capital invested. They, too, have little concern for the future of the ranges, though many of them are sufficiently powerful to retain absolute possession year after year and some even fence the Government land or put up substantial buildings on it. Up to 1913 these flocks had increased on the public lands without paying taxes, but there is now a tax of 4 cents gold a head on sheep and 20 cents a head on cattle or horses annually.

It is time to substitute intelligent direction and foresight for careless and irresponsible grazing.

''Flocks should so migrate from season to season that they may feed upon the ranges now abandoned to the guanaco and the ostrich when grass and water are abundant and return to the more constant pastures after the seed time of the pasture plants. The stockman must set aside the careless assumption that grass will grow year after year from the old roots, although it be nibbled down before the seed sets, again nibbled down when the young shoots sprout with the first rains, and kept nibbled down through rain and drought alike. It should be recognized that as the edible plants diminish the useless ones spread —that it is possible to change the flora of the region materially, to substitute the thorny and the bitter for the sweet and nutritious. All owners should realize that the pasture of the range is their capital, and that when it is being diminished by overgrazing, dividends are being paid from capital.

''In spite of the fact that the ranges have been exploited without care for a quarter of a century, they continue to support increasing numbers of sheep, together with a smaller proportion of horses and cattle. The persistence of the native pasture is thus well demonstrated and its capacity when it shall be intelligently managed may confidently be estimated as much greater than that which it now has.''

Since the water supply for stock is a controlling factor in the use of the ranges and in the determination of their value, each lessee ought to have his boundary determined in such a way that he may control a just share of the water of the country. The isolation of areas from the water supply should be made impossible. The region should be divided into large blocks, each of which should contain a proper proportion of winter and summer ranges and a reasonable proportion of the water. It goes without saying that this requires careful surveys and the detailed classification of the land. In general the winter pastures should lie in the plains and the summer pastures in the mountains.

In the Cordillera on the west are (1) eastern ranges suitable for pasturing sheep throughout the year, and (2) wooded western ranges where cattle may graze in summer on the wooded slopes and alpine pastures and where in winter they may descend to the deeper valleys on the bordering plains. Where the snow is not too heavy and where the underbrush affords shelter from the storms and the winds, cattle may very often remain in the forests even in winter. This allows each type of range a chance to recover and to seed itself naturally.

The third section of the book deals with the resources of the Andes between latitudes 39° and 44° S. Of special interest are the maps that accompany this section and which designate the location and extent of the agricultural lands, the disposition of the grass-covered country, and the distinction between burned-over land and brushy mountain slope on the one hand and virgin forests and the alpine country on the other. The forests and water power of the Cordillera, the possibilities for the development of future cities, and several appendices on the meteorology and the quality of certain Argentine woods, close this admirable report on a part of Argentina which is capable of a larger future development than any other section of the country.

It would be inadvisable to go into detail, in this place, into the many interesting geographic questions raised in Mr. Willis's book, ''Northern Patagonia.'' We must conclude by merely calling attention to such excellent paragraphs as those that deal with the grazing problems, the mountain resources, and the forests and pastures of the Cordillera. Especially do we wish to comment on the compact paragraphs on settlements and their relation to each other and the discussion of those problems in economic geography which the development of the region entails.